Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Development of SAW-driven single-photon source in an undoped AlGaAs/GaAs/AlGaAs quantum well structure TZU-KAN HSIAO, YOUSUN CHUNG, ANTONIO RUBINO, ATEEQ NASIR, HANGTIAN HOU, SEOK-KYUN SON, JONATHAN GRIFFITHS, THOMAS MITCHELL, IAN FARRER, DAVID RITCHIE, CHRIS FORD, Semiconductor Physics Group, Cavendish Laboratory, University of Cambridge — A lot of effort has been made to study single-photon sources due to their applications such as quantum key distribution and quantum repeater. In this research, a single-photon source driven by a surface acoustic wave (SAW) is in development. In this device, electrons and holes are induced in adjacent regions to form an n-i-p junction in an undoped AlGaAs/GaAs/AlGaAs quantum well by gates on the surface. A SAW launched by a transducer creates a moving electric potential and drags electrons from the induced region of electrons to the region of holes across a 1-D channel defined by a pair of side gates. A single-photon source can thereby be realised if the 1-D channel allows only one electron in each SAW-created potential minimum to reach the region of holes and recombine with holes. Recently, we have observed the SAW-pumped recombination current, which can be modulated by the side gates. This means that it is possible to transport a stream of single-electrons by SAW. In addition, the spectrum of the electroluminescence shows that the recombination happens in the quantum well when the n-i-p junction is under forward bias. We are now working on detecting the emission from the SAW-pumped recombination, and getting quantised current to realise the SAW-driven single-photon source.

Tzu-Kan Hsiao
Semiconductor Physics Group, Cavendish Laboratory, University of Cambridge

Date submitted: 17 Nov 2016 Electronic form version 1.4